usual combination in one-fourth of the F_2 offspring, leads the author to the conclusion that the difference between the wild oats and these various cultivated varieties is due to the presence in the latter of an inhibiting factor which prevents the development of the wild characters. As he has never found among the numerous crosses he has made between different cultivated varieties any instance in which the atavists made up one-sixteenth of the F_2, as they should do if different varieties possessed different inhibiting factors, he concludes that the same inhibiting factor is present in all the cultivated varieties, and that the different degrees of development of the awns and hairiness of the glumes which have been found to be dependent upon independent genes, must remain latent in the wild oats until the origin of an inhibiting factor brings them to light. On this ground he argues that the degree of discontinuity which results from any mutation depends upon the number of latent genes which are brought into manifestation by it, and also that various apparent correlations may result from the disappearance of a factor which had simultaneously inhibited both of the characters which appear to be correlated. The author does not take into account the hypothesis of "variable potency," which could also be made to explain how the same inhibiting factor in the various cultivated varieties could produce such various degrees of development of awns, hairiness of the glumes, etc., as are displayed by them.—GEORGE H. SHULL.

Mitosis in Spinacia.—This extensive investigation by STOMPS,[6] written in Dutch, but with an eleven page résumé in German, deals with mitosis in both vegetative cells and in the microspore and megaspore mother cells.

The *2x* generation shows 12 chromosomes arranged in pairs, which can be distinguished not only in the nuclear plate but also in the prophase, and pairs probably persist in the resting nucleus. No continuous spirem is formed, the two components of each pair, as soon as they can be distinguished, having two free ends. A longitudinal splitting of the chromosome occurs in early prophase, a longitudinal row of vacuoles appearing, and these, by increasing in size, split the chromosome. This mode of splitting results in threads with alternating thickened and slender portions, but STOMPS does not regard the thickened portions as chromomeres or ids, nor does he regard the slender portions as linin, but both are the same in substance.

In the prophase of the reduction division, before synapsis, the 12 chromosomes fuse in pairs, forming 6, each with two free ends. There is not only a pairing, but also a genuine fusion of the two chromosomes of each pair. No continuous single or double thread is formed. As the nucleus comes out of synapsis, one sees 6 chromosomes, each evidently double, and the two mem-

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[6] STOMPS, THEO. J., Kerndeeling en Synapsis bij *Spinacia oleracea*. 8vo. pp. 162. *pls.* 2. 1910. A briefer account in German, which is partly a summary and partly a translation of the original, is published in Biol. Centralbl. **31**: 257–320. *pls.* 1–3. 1911.

bers of a pair may separate at this stage. Tetrads sometimes occur at this time. The mantle fibers (*Zugfasern*) are believed to persist from one cell generation to another. The nuclear membrane is a tonoplast, and the nuclear cavity a complex of vacuoles.

Many of the figures look rather diagrammatic, but they are carefully drawn, and the summary indicates that the author, at least, feels certain of his principal conclusions. The work is so extensive and so well presented that it cannot be laid aside; cytologists should either confirm the conclusions or correct them.—CHARLES J. CHAMBERLAIN.

Fungi in rhizoids of liverworts.—Investigation of about thirty species of liverworts by GARJEANE[7] shows that there is no uniformity in the occurrence of fungi in the rhizoids. In some forms the presence of fungi seems to be the rule; in others, especially the bark-inhabiting forms, their presence seems to be the exception. In the same colony individuals with infected rhizoids often occur together with others not infected. The details of the mode of growth of the hyphae are described for *Lophozia inflata* and species of *Cephalozia* and *Cephaloziella*. From the details it appears that the plants in no way profit as a result of the presence of fungi in their rhizoids. On the contrary, the protoplasm in the young rhizoids, and also in the neighboring cells when these are infected, is killed by the fungi. Extended infection of rhizoids is accompanied by sickening of the plants. An interesting reaction of the rhizoids to the attack of the fungus is described in *Lophozia*. When the hypha comes into contact with a rhizoid, a thickening appears on the inside of the rhizoid wall opposite the point of contact. As the hypha grows into the cell, cellulose is continually deposited ahead of the growing point, so that the hypha is surrounded by a sheath of cellulose. Often hyphae pass straight through rhizoids in this way, and become incased in a tube of cellulose. The author was successful in isolating the same species of fungus, described as *Mucor rhizophilus*, from nine species of liverworts. A large number of successful infections was made with this fungus in sterile cultures of *Lophozia inflata*, *Cephalozia bicuspidata*, *Cephaloziella* sp., and *Jungermannia ventricosa*. The author believes that the association of fungus and rhizoid is not of the nature of a mycorhiza; neither does the fungus cause considerable damage to the plant, although strongly infected plants show the unfavorable influence of the fungus.—H. HASSELBRING.

Fall of petals.—FITTING[8] finds that a number of stimuli will cause the premature falling of the corollas of various sympetalous and polypetalous flowers. He worked in the main, however, with *Geranium pyrenaicum*. Among chemi-

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[7] GARJEANE, A. J. M., Die Verpilzung der Lebermoosrhizoiden. Flora **102**: 148–185. *pls. 11, 12. figs. 9.* 1911.

[8] FITTING, HANS, Untersuchungen über die vorzeitige Entblätterung von Blüten. Jahrb. Wiss. Bot. **49**:187–263. 1911.